

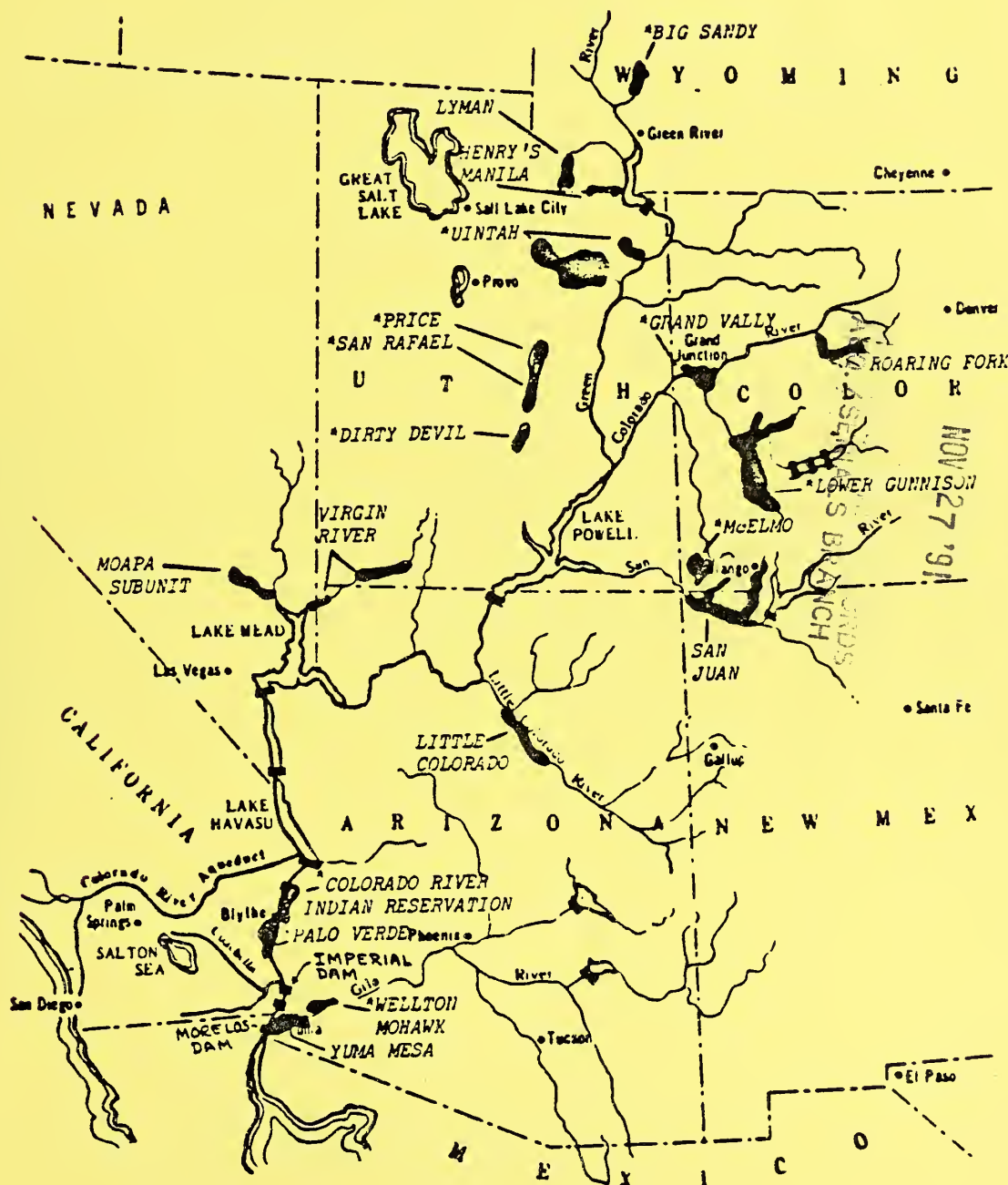
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1981

# USDA ANNUAL REPORT COLORADO RIVER BASIN SALINITY CONTROL PROGRAM



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## FOREWORD

The Colorado River Basin Salinity Control Act of June 24, 1974, (Public Law 93-320) provides for the enhancement and protection of the quality of water available in the Colorado River for use in the United States and Mexico. This 1981 Annual Report on the Colorado River Basin Salinity Control Program has been prepared to explain the progress, the activities, and the salinity control accomplishments achieved through the U.S. Department of Agriculture (USDA) Program this past year. USDA is pleased with the onfarm irrigation and salinity control accomplishments thus far, and looks forward to continued improvement in the program in 1982.



1981  
USDA ANNUAL REPORT  
Colorado River Basin Salinity Control Program

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## EXECUTIVE SUMMARY

This U.S. Department of Agriculture (USDA) 1981 Annual Report on the Colorado River Basin Salinity Control Program provides a general overview of USDA activities. It serves as an information and explanatory document for USDA agencies, U.S. Department of the Interior (USDI) agencies, the U.S. Environmental Protection Agency (EPA), the Advisory Council, the Forum, and other cooperating agencies or interest groups.

### Title I

1. The USDA program on the Wellton-Mohawk project continues to make good progress with 306 applications having been received representing over 48,900 acres since the program began. There are now 207 contracts covering over 31,000 acres of the 50,000 acres targeted for assistance.
2. Over \$9.4 million of Federal cost-share funds have been spent on irrigation water management improvement practices on about 22,000 acres resulting in a reduction of deep water percolation of 39,500 acre-feet in 1981.

### Title II

1. The Grand Valley project has over 500 individual applications for cost sharing and technical assistance on about 7,000 acres of irrigated agriculture. Improved irrigation water management reduced deep percolation by 2,690 acre-feet and resulted in 13,500 tons of salt load reductions to the Colorado River. This is equivalent to a 1.41 milligram per liter (mg/l) salinity reduction at Imperial Dam.
2. Planning for total onfarm irrigation water management systems and subsequent irrigation water management followup assistance are major Grand Valley project needs which will receive further emphasis in 1982. Specific staff assignments have been made to address this need.
3. In Uinta Basin, a U.S. Fish and Wildlife Service biologist has just completed a 2-year assignment working with the USDA Soil Conservation Service. This special arrangement has been beneficial for wildlife and wetland mitigation planning.
4. Of 154 Uinta Basin applicants, 70 percent of the farmers (106) have signed long-term agreements (LTA's) obligating over \$3.0 million of the Uinta \$3.5 million Agricultural Conservation Program (ACP) funds. A total of 12,028 irrigated acres has been treated after 2 years of implementation.
5. Martin Lateral, a Public Law 566 watershed protection project, is also being used successfully in the Uinta Basin to improve irrigation water management for salinity control. Three contracts covering 218 acres have been signed. Five remaining contracts are awaiting funding to complete the small 2,700-acre project.

6. As a result of the 1980 program review, four issues have been addressed: (1) ASCS requirements for automation; (2) onfarm water management followup; (3) uniform Soil Conservation Service (SCS)-U.S. Bureau of Reclamation (USBR) lateral design and sizing; and (4) monitoring and evaluation. Other issues remain which include cost-share and staffing limitations, and the reliability of automated equipment.
7. Agricultural Research Service (ARS) efforts have focused on the evaluation of level basins, automated equipment, irrigation scheduling, and participation in demonstration projects.
8. Three USDA studies on irrigation salt source units were completed in 1981 and two more are scheduled for completion in 1982.
9. Interagency activities continue to function smoothly. A revised and consolidated USDA agencies' Memorandum of Understanding (MOU) has been developed for Grand Valley and the Uinta Basin.
10. Funding levels for FY 1982 continue at approximately the same rate as in 1981. A total of \$5,147,000 will be available to USDA for salinity control in the Colorado River.
11. Consolidated USDA funding and other funding approaches are presently under consideration by the Department.
12. The 1982 USDA activities will focus on irrigation unit studies, implementation, and monitoring and evaluation.

## INTRODUCTION

Salinity problems in the arid and semiarid areas of the United States (U.S.) are a critical concern to those involved in the management of our natural resources. The salinity problem can take two forms. One is a salinity buildup in the soil root zone that reduces or precludes an economic return from growing agricultural crops. The other is excessive salinity in groundwater, lakes, streams, and rivers that reduces or precludes their use for irrigation, domestic, municipal, and industrial water supply or for fish and wildlife habitat. Irrigation specialists agree that improved irrigation efficiency, in many circumstances, offers an effective approach towards reducing the contribution to salinity in river systems from irrigation. Frequently, it is the most cost effective option identified.

The USDA has gained considerable experience in the Colorado River Basin Salinity Control Program during the past several years. Starting in about 1973, the U.S. Salinity Laboratory at Riverside, California, the U.S. Water Conservation Laboratory at Phoenix, Arizona, and the Irrigation Water Management Research Unit in Fort Collins, Colorado, have conducted field research and demonstration projects in this field. These were aimed directly at evaluating various existing options for increasing irrigation efficiency--thus reducing the salt load in the return flow to the Colorado River--and to develop additional new technology. This work, supported in part with funds from the EPA and the USBR and complemented by work of the University of Arizona and Colorado State University, had a substantial impact on the development of the technical assistance and cost-sharing programs of USDA.

USDA has performed detailed studies in several high priority irrigated areas which are potential contributors to the salinity problem of the Colorado River. These studies and the resulting reports quantify the salinity contribution from onfarm irrigation; recommend an implementation plan; and identify the costs, benefits, and effects of implementing the plan.

Implementation of the first plan began in 1974 in the Wellton-Mohawk Drainage and Irrigation District in Arizona. Implementation in two additional units, the Grand Valley in Colorado and the Uinta Basin in Utah, is now underway. Initial implementation schedules are for 10-year periods but will be readjusted based on available resources.

### Background

The Colorado River Basin encompasses portions of seven States: Colorado, Wyoming, Utah, Nevada, New Mexico, California, and Arizona. The river is 1,400 miles long, with its headwaters in Wyoming and Colorado. It empties into the Gulf of California and serves some 14.5 million people on its way. It is one of the most physically developed and regulated rivers in the Nation. In 1964, the waters were totally consumed and flows no longer reached the Gulf of California.

The river flow is apportioned among Upper and Lower Basin States and the Republic of Mexico. There are some 2.6 million acres of private irrigated



cropland and some 44 million acres of nonfederal forest and rangeland within the United States' portion of the Basin.

Salinity control in the Colorado River Basin is addressed in the Colorado River Basin Salinity Control Act of 1974, Public Law 93-320. The Act has two major components. One is to maintain the quality standard agreed to on August 30, 1973, in Minute 242 of International Boundary and Water Commission for water delivered to Mexico under the Mexican Water Treaty of 1944. This is covered in Title I of the Act which includes a large desalting plant to treat drainage return flows from the Wellton-Mohawk Irrigation and Drainage District near Yuma, Arizona.

The second component, covered in Title II of the Act, deals with the salinity concentration in the River above Imperial Dam and the controls necessary to meet U.S. water quality standards established by the seven basin States and EPA.

USDI is assigned leadership responsibilities which has been delegated to the USBR of that Department. USDA and the EPA are named as cooperating agencies and USDA's involvement is documented in a MOU with Interior.

#### The Salinity Problem

The salinity of the water delivered to Mexico increased from an annual average of about 800 mg/l to nearly 1,500 mg/l in 1962. This was partially attributed to the highly saline drainage return flows from the Wellton-Mohawk area which empties into the Colorado River below Imperial Dam. Title I of the Act deals with this problem.

The total salt load in the river entering Lake Mead above Hoover Dam is estimated to average 10 million tons per year. To meet the salinity control objective of Title II, it is necessary to remove some 2.8 million tons per year of this salt load. The present average annual salinity concentration of the river varies from about 50 mg/l in the headwaters to about 820 mg/l at Imperial Dam. The USDI projects a future salinity level of 1,141 mg/l at Imperial Dam for the year 2000 as additional upstream development takes place, assuming no corrective action. The long-term average annual salinity concentration at Imperial Dam is 875 mg/l under current development conditions. Each mg/l increase in salinity concentration causes approximately \$469,000 per year (first quarter 1981 dollars) in economic damages to downstream agricultural, municipal, and industrial water users within the U.S. The control of salinity in the river at the historic level, while the States continue to develop compact apportionments of water supply, is required by an agreement made between the seven Basin States and EPA for implementation of Public Law 92-500, the Clean Water Act.

Average onfarm irrigation and distribution system efficiencies, especially in the Upper Basin, are generally low. Low irrigation efficiencies generally indicate high surface runoff and/or overirrigation. Overirrigation can result in excessive deep percolation which leaches excess salts from the soil into the river. This greatly contributes to the salinity problem.

Irrigation contributes some 37 percent of the total salt load to the river in the Upper Basin.

There are approximately 1 million acres of irrigation agricultural land in 17 identified salt sources units in the Upper Basin. It is estimated that a portion of at least seven of these units will be justified or feasible as salinity control projects. This would involve about 400,000 acres of treatment.

#### USDA Title I Activities

The Department, through SCS, initiated an intensive onfarm irrigation improvement program in 1974 to reduce the quantity of irrigation return flows from the 65,000-acre Wellton-Mohawk Irrigation and Drainage District. Reduction of irrigation return flows will allow for the reduced design capacity of the desalinization plant at Yuma, Arizona. SCS's involvement is in accordance with a Memorandum of Agreement (MOA) between SCS and the USBR and a Memorandum of Understanding (MOU) between USDA and USDI.

Technical assistance and cost-share assistance are provided through contracts with individual farmers for practices that meet the objectives. SCS expenditures are reimbursed by the USBR. Over 40 percent of the planned program has been installed. This activity is supported by research of the ARS. Although current research is not directly related to the Title I Program of Public Law 93-320, the U.S. Water Conservation Laboratory continues to carry on water management research in the Wellton-Mohawk area, and this is expected to contribute to the continuing job of irrigation water management. Research on remote sensing is intended to lead to more effective irrigation scheduling. New automated devices allow automated irrigation to be based on the amount of water delivered, as opposed to just the duration of irrigation flow.

The U.S. Salinity Laboratory has completed a 2-year study to develop management guidelines for irrigation under the adverse conditions caused by flooding on the Gila River, so that salt damage might be minimized.

#### USDA Title II Activities

USDA activities in the Title II area are in accordance with an MOA between SCS and the USBR. Supplemental MOU's between ARS, Agricultural, Stabilization, and Conservation Service (ASCS), Extension Service (ES), and SCS cover coordination within the Department.

Presently, SCS is using river basin funds (Public Law 83-566) for surveys, investigations, and resulting study reports, while conservation operations technical assistance funds are used for implementation technical assistance. The latter is supplemented with a 5 percent transfer from ASCS based on the commitment of ACP funds. ASCS is using targeted ACP funds for cost sharing salinity control measures. The cost-sharing rate varies from 75 to 90 percent depending on the incentive needed for a specific practice. ARS is using funds appropriated for research to develop more efficient surface

irrigation, more reliable and effective equipment for automatic surface irrigation, and improved water management practices. ES is using funds appropriated for extension to conduct demonstration, information, and education programs. Extension specialists conduct water management workshops and other educational programs for farmers, technicians, county agents and agriculture service and supply firm personnel. Extension specialists also work with farmers in monitoring and evaluating crop production and irrigation systems to fine-tune practices for greater economy and efficiency. The Farmers Home Administration is providing loan assistance for landowner's nonfederal share of improvements.

USDA, in cooperation with other agencies, has completed five salinity control studies and issued reports. These are for the Grand Valley and Lower Gunnison units in Colorado, the Uinta Basin unit in Utah, the Big Sandy unit in Wyoming and the Moapa Valley subevaluation unit of the Virgin River units in Nevada. Studies in four additional irrigated units are nearing completion. These are the Price-San Rafael Rivers in Utah, the McElmo unit in Colorado, and two additional Virgin River subevaluation units involving parts of Nevada, Utah, and Arizona.

Implementation started in Grand Valley in 1979 and the Uinta Basin in 1980. The implementation programs were scheduled for completion within a 10-year period. Typical measures included in salinity control plans include irrigation pipelines, land leveling, water measuring and control structures, sprinkler systems, ditch lining, automation devices, changes in irrigation methods, and irrigation water management.

The costs of implementing the recommended plans have been estimated. For consistency and intercomparison between these plans and the Wellton-Mohawk effort, a 75 percent cost-share rate has been assumed in all planning studies. This upper limit was chosen to insure full participation, and because a large share of the salinity benefits are off-farm and downstream. Extensive technical assistance, research, education, and demonstration are required to make the program effective. The costs in 1982 dollars and a schedule by units based on a 10-year installation period follow as Enclosure 1. Estimated costs over a 16-year period for the eight units shown are \$296.8 million for cost sharing; \$4.6 million for education; \$12.8 million for research and demonstration; and \$59.8 million for technical assistance. The fiscal year outlays would peak at \$50.4 million in FY 1987.

### Benefits

Benefits related to water quantity, water quality and reduced salt loadings are major factors in the onfarm salinity control projects. Completed reports indicate onfarm irrigation efficiency improvements will range from 3 to 17 percent in the Grand Valley, Uinta Basin, Moapa Valley, and Lower Gunnison salt source units. No recommended plan has been established for the



USDA SCHEDULE AND COST ESTIMATE  
COLORADO RIVER BASIN SALINITY CONTROL PROGRAM

Irrigation Units	Study Area	Irrigated Acres		Total Costs (mil \$)	USDA <sup>1/</sup> Costs 75% C/S (mil \$)	Fiscal Year Cost-Share Assistance (mil \$)																	
		Total (1000)	Treated (1000)			Actual						Indexed to February 1982											
						77	78	79	80	81	82	83 <sup>4/</sup>	84	85	86	87	88	89	90	91	92	93	94
<u>STUDIES COMPLETED</u>																							
Grand Valley, CO	126	66	50	64	38.8	////	1.7	1.7	1.7	1.7	1.7	1.7	4.0	7.3	7.3	7.3	7.3						
Uinta Basin, UT	2910	200	122	83	76.9	////			2.0	2.0	2.0	2.0	4.0	12.4	12.4	12.4	12.5	12.4					
Moapa Valley, NV	560	5	5	8	4.9			////					1.0	1.0	1.0	1.0	0.9						
Lower Gunnison, CO	846	182	169	180	108.7	////								10.6	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Virgin Vly, NV, AZ	1300	4.6	3.5	4	2.3				////				1.0	0.4	0.3	0.3	0.3						
Big Sandy, WY	1227	16	16 <sup>2/</sup>	39	37.4 <sup>2/</sup>	////									7.4	7.5	7.5	7.5	7.4				
<u>STUDIES NEARLY COMPLETE</u>																							
McElmo Creek, CO	1342	29	19	30 <sup>3/</sup>	18				////						3.0	3.0	3.0	3.0	3.0	3.0			
Price-San Rafael, UT	68	68	25	18 <sup>3/</sup>	14				////					0.5	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
SUBTOTALS	8379	570.6	409.5	426	301	Subtotals	1.7	3.7	3.7	3.7	3.7	3.7	10.0	32.2	43.8	43.9	43.9	35.3	22.8	15.4	12.4	12.4	12.4


**STUDIES UNDERWAY - PENDING**

Upper Virgin River, UT	14	Underway
CO Indian Res., AZ	107	Cooperative River Basin Study
Mancos Vly, San Juan, CO	8	Underway
Little CO River	21	Cooperative River Basin Study
Palo Verde, CA	91	Pending
Dirty Devil, UT	26	Pending
Roaring Fork, CO	40	Pending
Henry's Fork, WY	28	Pending
Lyman, WY	58	Pending
SUBTOTAL	393	
TOTALS	8379	963.6 409.5 426 301

**FOOTNOTES:**

- <sup>1/</sup> - Indexed to Feb. 1982 \$  
<sup>2/</sup> - Includes 13,700 acres of land retirement  
<sup>3/</sup> - Estimate only, studies to be completed in FY 1982  
<sup>4/</sup> - President's FY 83 budget provides \$0.3 million  
 Anticipate congressional restoration to FY 82 level

**LEGEND**

Planning -   
 Implementation - cost-share at 75%

Program Activities	Funding by Fiscal Years (mil \$)																		
	Actual					Indexed to February 1982													
	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	Totals	
<u>Planning</u> Basin Studies (SCS)	0.6	0.5	0.4	0.4	0.2	*	0.1	0.2	0.2									2.6	
<u>Implementation - Technical Assistance</u> (SCS)																			
Onfarm Planning-Installation of Practice		0.2	0.4	0.6	0.6	0.5	1.3	4.7	6.1	6.2	6.2	5.4	3.7	2.0	1.9	1.9	0.3	42.0	
Onfarm Followup Water Management					0.1	0.2	0.3	0.7	0.9	1.2	1.3	1.3	1.1	0.7	0.4	0.4	0.4	9.0	
Monitoring and Evaluation							0.7	0.6	0.8	0.8	0.8	0.7	0.5	0.3	0.3	0.3	0.1	5.9	
Subtotal SCS technical assistance		0.2	0.4	0.6	0.7	0.7	2.3	6.0	7.8	8.2	8.3	7.4	5.3	3.0	2.6	2.6	0.8	56.9	
<u>Research and Demonstration</u> (ARS, CSRS)		0.2	0.3	0.5	0.6	0.9	1.3	1.3	1.3	1.3	1.3	1.3	1.0	0.7	0.4	0.3	0.1	12.8	
<u>Extension Education</u> (Extension Service)					0.1	0.0	0.2	0.4	0.5	0.6	0.6	0.5	0.5	0.3	0.3	0.2	0.2	4.4	
<u>Cost Sharing @ 75% Rate</u> (ASCS)		1.7	3.7	3.7	3.7	3.7	10.0	32.2	43.8	43.9	43.9	35.3	22.8	15.4	12.4	12.4	12.4	301.0	
TOTALS	0.6	2.6	4.8	5.2	5.3	5.3	13.9	40.1	53.6	54.0	54.1	44.5	29.6	19.4	15.7	15.5	13.5	377.7	
	(\$18.5 million to date)					(\$359.2 million projected)													

\* Planning Suspended

Big Sandy unit. Table II-1 below shows the salt load reductions and salinity concentration reduction impacts at Imperial Dam for the same four projects.

Table II-1 - Salinity Control Impacts at Imperial Dam  
for Recommended Plan

<u>Irrigation Unit Area</u>	<u>Salt Load Reduction (Tons)</u>	<u>Reduced Salinity Concentration (mg/l)</u>
Grand Valley (CO)	130,000	13
Uinta Basin (UT)	76,000	10
Moapa Valley (NV)	19,000	2
Lower Gunnison (CO)	335,000	35

These reductions provide significant water quality benefits based upon \$469,000 average annual downstream damages for each mg/l increase in salinity.

The major benefits from the Colorado River Basin Salinity Control Program are national and regional in scope. The national need is to maintain the salinity differential in the Colorado River water delivered to Mexico in accordance with the 1973 agreement (Minute No. 242 of the International Boundary and Water Commission, United States and Mexico). The regional need is to maintain current salinity levels in Colorado River water withdrawn for downstream use while allowing the Upper Basin to further develop its compact-apportioned waters.



## IMPLEMENTATION PROGRESS

Major USDA activities on implementation projects are focused upon onfarm irrigation water management improvements and related irrigation lateral delivery systems improvements. Major objectives are to improve irrigation water use efficiencies and to reduce irrigation waters from deep percolation into saline substrata underlying the irrigated croplands. A cross section of existing USDA agency programs, authorities, and staffing are utilized in the implementation program efforts to date. Among these are the SCS, the ASCS, the ES, and the ARS. There is also extensive input and assistance provided by the State level Cooperative Extension Service, the agricultural land grant colleges, the local conservation districts, and local irrigation districts.

### Title I - Wellton-Mohawk, Arizona

The Wellton-Mohawk project was the first irrigation improvement program implemented. Authority for USDA and SCS participation in the Wellton-Mohawk Irrigation Improvement Program is contained in Title I of Public Law 93-320, the November 1974 MOU between the USDI and USDA, and the December 1974 MOA between the USBR and the SCS.

Rules and regulations for administering the program were published in the Federal Register on March 29, 1976. The SCS operations handbook used at the field level to develop conservation plans of operations and to prepare and execute contracts with landowners and operators was issued July 1, 1975.

The SCS enters into contracts with eligible landowners and operators (cooperators) to install conservation practices that will directly contribute to the objectives of the program. The SCS contract provides for technical assistance and irrigation water management efficiency checks over a 2-year period after installation of the practices.

A cost-share rate of 75 percent Federal and 25 percent cooperator has been established by the Secretary of the Interior. Funds to cover the contract cost sharing and the SCS technical services are transferred periodically from the USBR to the SCS under the Title I MOA. In FY 1981, 39 contracts were signed between cooperators and the SCS on 4,799 acres. This involved \$1,686,983 of Federal funds and \$562,328 of cooperator funds.

Land eligible to participate in the SCS onfarm improvement program includes all irrigable land in the district as established by the "Report of Productivity Reexamination Board, Wellton-Mohawk Irrigation and Drainage District," dated July 3, 1973. Formerly, the USBR had identified certain lands in the district for purchase as part of the acreage reduction program, making this land ineligible to participate in the SCS program. With the completion of the USBR's acreage reduction program, all irrigable land in the district is now eligible to participate in the SCS onfarm improvement program.

The SCS establishes planning and installation priorities in order to use effectively the resources allocated to this program. Priorities are established by considering historical irrigation efficiencies and crops grown,

the adequacy of the onfarm irrigation systems, and soil characteristics. Lands with the greatest potential for increasing irrigation efficiencies and decreasing drainage return flows receive the highest priority.

A total of 306 applications for cost sharing has been received on some 48,000 acres since the inception of the program. Contracts have been developed on a total of 207 priority applicants on 31,052 acres.

Conservation practices planned under the contracts in FY 1981 include 131,281 linear feet of ditch lining, 4,762 acres of land leveling, 1,054 structures for water control and measurement, and 56 acres of soil improvement.

All SCS contracts are reviewed by the Wellton-Mohawk Valley Natural Resource Conservation District Board. After all practices under a contract are installed, technical assistance is provided by SCS personnel for an additional 2 years to help the farmer improve his irrigation water management efficiency.

Table III-1 provides a summary of practices installed. Table III-2 illustrates progress and accomplishments in contracting and acres treated. Contracting progress has been good, progress is excellent and total acres treated represent approximately 40 percent of project objectives.

Irrigation water management plans and technical assistance are being provided to farmers participating in the program to help them achieve higher irrigation application efficiencies, thus reducing deep percolation losses and drainage return flows. Table III-3 summarizes the irrigation efficiencies for the 1981 crop year. Irrigation efficiency improvements show a range from a low of 8 percent in sorghum (630 Ac.) to a high of 63 percent in lettuce (1,541 Ac.) production. Even more significant are the 25-31 percent efficiency improvements on over 17,000 acres of alfalfa, wheat, and cotton. These improved irrigation efficiencies lead to a substantial reduction in deep percolation. Table III-4 shows the reduction in deep percolation for each crop. It is estimated that during the 1981 crop year deep percolation was reduced 39,495 acre-feet on the 20,060 acres with practices installed (under contract). The greatest per-acre reductions were with citrus, lettuce and alfalfa crops at 6.65, 4.30, and 2.71 acre-feet reductions respectively. Also, a total deep percolation reduction of nearly 30,000 acre-feet was achieved on the three major crops of cotton, wheat, and alfalfa.

Generally, it can be concluded that the Wellton-Mohawk project is making substantial progress and has had a major impact on improving irrigation efficiencies, reducing deep percolation, and reducing irrigation return flows.

TABLE III-1

Practices Installed  
SCS Onfarm Improvement Program  
Wellton-Mohawk Irrigation and Drainage District

	PRACTICES INSTALLED	
	DURING FY-1981	TOTAL TO DATE 1975 to 1981
Federal Cost	\$2,143,019	\$ 9,423,345
Nonfederal Landowner Costs	<u>714,340</u>	<u>3,141,115</u>
Total Cost <u>1/</u>	\$2,857,359	\$12,564,460
1. Ditch Lining (linear feet)	176,866	833,085
2. Land Leveling (acres)	4,890	26,048
3. Structures for Water Control and Measurement (number)	1,158	6,124
4. Soil Improvement (acres)	1,315	1,656
5. Pumping Plants (number)	2	10
6. Pressure Irrigation Systems (number)	2	9
7. Vertical Underground Barriers (linear feet)	6,628	6,628
8. Irrigated System, Automated	1	4
<u>1/</u> Excludes 1981 SCS technical assistance costs of \$401,694 and total SCS technical assistance to date of \$1,631,000.		

TABLE III-2

Application Contracting and Treatment Progress  
SCS Onfarm Improvement Program  
Wellton-Mohawk Irrigation and Drainage District

	FY-81	To Date
Application	24	306
Total Acres Under Applications	3,135	48,900 <u>1/</u>
Salinity Control Plans and Contracts	39	207
Total Acres Under Contract	4,799	31,052
Total Acres Treated <u>2/</u>	5,460	20,060 Ac. <u>1/</u>
<u>1/</u> The total project goals for irrigation water management and salinity control improvements are approximately 50,000 acres.		
<u>2/</u> Acres treated are those lands on which all planned work and irrigation water management improvement practices have been completed.		

TABLE III-3

Irrigation Efficiencies  
Before and After Practices Installed  
SCS Onfarm Improvement Program  
Wellton-Mohawk Irrigation and Drainage District

Crop Year 1981

NUMBER OF CONTRACTS 1/	CROP	ACRES 2/	IRRIGATION EFFICIENCY	
			Before 3/ Percent	After 4/ Percent
34	Alfalfa	3,611	63	87
42	Wheat	5,143	63	87
60	Cotton	8,298	63	94
8	Bermuda	571	63	81
11	Lettuce	1,542	15	78
6	Citrus	265	35	84
6	Sorghum	630	63	71

1/ The number of contracts that had all or part of a farm in any of the crops shown.

2/ Total acres in crops is greater than total acreage in contracts under IWM obligation due to double-cropping of wheat followed by cotton and sorghum.

3/ Average of all crops on the farm from 1970 until the signing of a contract.

4/ Average for the 1981 crop year (determined from district delivery records).



TABLE III-4

Deep Percolation  
SCS Onfarm Improvement Program  
Wellton-Mohawk Irrigation and Drainage District

Crop Year 1981

Crop	Before Ac-Ft/Ac	After Ac-Ft/Ac	Difference Ac-Ft/Ac	Savings	
				Acres	Ac-Ft
Alfalfa	9.84	7.13	2.71	3,611	9,786
Wheat	3.49	2.53	0.96	5,143	4,937
Cotton	5.56	3.72	1.84	8,298	15,262
Bermuda	5.44	4.07	1.37	571	782
Lettuce	5.33	1.03	4.30	1,542	6,630
Citrus	11.41	4.76	6.65	265	1,762
Sorghum	3.49	3.10	0.39	630	246
TOTALS				20,060	39,495

Title II - Grand Valley, Colorado

The Grand Valley area was the first USDA salinity control study completed in December 1977. The report, "Onfarm Program for Salinity Control" was supplemented in March 1980 with "Supplement No. I" covering irrigation lateral improvements needed to support the onfarm program.

Staffing for necessary technical assistance was increased by SCS in 1981. Four additional positions were added to the Grand Junction field office bringing the total staff to 13. The additional staff was needed to service the high demands for technical assistance generated by over 500 requests for individual annual ACP cost-share practices. One staff position was added to provide strictly onfarm followup assistance in the area of improving onfarm irrigation water management operations and efficiencies after the salinity control practices are installed.

Two areas of technical assistance need further emphasis in the Grand Valley project. The first area is more advanced planning of total irrigation lateral systems and complete onfarm water management salinity control plans. This would provide for a more orderly and systematic sequence of salinity control practice installation. A second area of critical importance is expanded efforts in working with individual onfarm operators on a post-implementation followup irrigation water management program. After practices are installed, the proper operation and management of the irrigation water management system are vital for successful salinity control results. Timing irrigation sets, maintaining and operating automated and semiautomated equipment, and proper treatment and repair of installed

practices are major areas needing further individual onfarm followup assistance. This activity could be classified as a quasi-education and quasi-technical followup effort. The Cooperative Extension Service is working in conjunction with SCS and the USBR to develop an extension education program with local staff positions to assist with organizing irrigation lateral groups and to work with onfarm irrigation water management followup.

SCS and ARS have been working towards expanding and improving the use and development of automated systems. Several educational demonstration systems have been installed. The adoption and use of different automated systems have created some technical problems. However, the majority of the problems have been more closely related to the automatic timers as opposed to the automated equipment and facilities for different automated systems.

A separate issue regarding automated systems was the initial requirement for all participants to use and install automated equipment as a condition to ACP cost sharing. Subsequently ASCS issued a policy change which eliminated this requirement. The new policy states that where SCS determines that automated water control devices are needed and feasible, and where farmers opt to use automatic controls, the automated devices can be included as eligible cost-share items by the ASC county committee.

On the design and sizing of irrigation laterals, SCS and USBR were initially using different criteria and standards. Because of the need for consistency within the project area, SCS and USBR have worked to develop compatible lateral-sizing requirements and similar lateral design criteria is now being used by both agencies.

Major practice accomplishments for FY 1981 and total to date are shown in Table III-5 below.

TABLE III-5

Grand Valley Water Management and Salinity Control Accomplishments

	1981	Total
Pipeline Laterals (Linear Feet)	43,732	104,051
Concrete Laterals (Linear Feet)	18,786	56,136
Ported Ditch (Linear Feet)	38,453	92,848
Gated Pipe (Linear Feet)	35,333	76,259
Pipeline	65,400	155,661
Land Leveling (Acres)	500	1,500
Drip/Sprinkler System (No.)	2	8
Structures (No.)	144	386
Cost Shares Earned (\$1,000)	1,554	3,417
Acres Served (Acres)	1,200	7,261
Farmers Receiving Cost Shares (No.)	91	530

As a result of these onfarm and related lateral improvements, there has been an estimated reduction of 1,100 acre-feet of seepage and deep percolation during 1981. This annual reduction of deep percolation translates into an estimated reduction of 5,500 tons of salt or 0.57 mg/l of salinity concentration at Imperial Dam. Total benefits in the Grand Valley project to date are 2,690 acre-feet reduction of deep percolation and 13,500 tons of salt reduced or a 1.41 mg/l salinity concentration reduction at Imperial Dam.

The first year monitoring report of onfarm irrigation improvements was completed by Colorado State University under contract with ARS and in cooperation with SCS. The report, entitled "Monitoring and Evaluation of On-Farm Irrigation Improvements in the Grand Valley Salinity Control Project," is available from both SCS and ARS. The major findings concluded that the automatic timers were generating problems in the automated systems, but that there was substantial reductions in deep percolation of irrigation waters. A second year report is now in the review draft stages and should be released soon.

#### Title II - Uinta Basin, Utah

The Uinta Basin salinity control project, initiated in 1980, is the second and only other Title II implementation project. Funding for the Uinta Basin project is also through the ASCS ACP and the SCS conservation operations technical assistance program.

Major 1980-81 planning activities related to the Uinta project include (1) an addendum to initial USDA Salinity Control Report; (2) the development of an environmental impact statement (EIS) supplement to the USBR/USDA original EIS; and (3) a USDA irrigation lateral study. The addendum to the USDA report updated the routing procedures for salinity impacts and adjusted the cost and benefit base figures. The EIS supplement has completed the review process and is ready for final publication. The Uinta lateral study has been essentially completed, however, final disposition of a separate report has not yet been determined.

An increased SCS staffing level for providing technical assistance has been maintained at 15 for the Vernal and Roosevelt field office. However, the 2-year U.S. Fish and Wildlife Service IPA biologist position expired and was terminated in October 1981. This unique staff arrangement proved to be beneficial to both agencies and their technical program staffs for wildlife mitigation planning and implementation activities.

When the Uinta project was initiated, it was determined that a special concentration or focusing of technical assistance to target areas in the project would be most effective. Also, the use of long-term agreements (LTA's) was chosen as the major approach for total onfarm water management and salinity control planning. The use of LTA's and the target area approach have been very successful in providing high visibility for the salinity control projects, for establishing a more long-term farmer commitment, and in obligating a high percentage of available funds.



The following shows the annual and LTA commitments and fund distribution made in 1980 and 1981 from a total of \$4 million which was available from ACP:

	<u>Annual</u>	<u>LTA</u>	<u>Total</u>
\$ Obligated	\$488,574	\$3,032,943	\$3,521,517
Farmers Assisted	48	106	154

These figures indicate approximately 70 percent of the farmers assisted have LTA's and that about 85 percent of the funds are obligated through these LTA's. A total of 12,028 acres has been affected by the program in a short 2-year timeframe.

Actual accomplishments for FY 1981 and totals to date are shown in Table III-6 below:

TABLE III-6

Uinta Basin Water Management and Salinity Control Accomplishments

Practices		FY-1981	Total
Pipeline Laterals (High and Low Pressure)	(Ft.)	240,719	435,698
Side Roll Sprinkler	(Ft.)	35,536	42,996
Pivot Sprinkler	(Ft.)	2,582	3,862
Gated Pipe	(Ft.)	13,700	31,140
Wheellines	(Ft.)	9,920	53,600
Regulating Reservoir	(No.)	8	15
Pumps and Motors	(No.)	21	29
Land Leveling	(Ac.)	141	174
Wildlife Habitat Management	(Ac.)	93	93
Pasture Management	(Ac.)	594	594

An additional implementation authority now being used in the Uinta Basin project is the SCS Public Law 566 Watershed Protection and Flood Prevention program. A separate land treatment watershed protection project has been authorized for the 2,700-acre Martin Lateral watershed. Since authorized for operations in July 1981, there have been three separate land treatment contracts developed and approved covering 218 acres in the watershed. Five additional contracts are awaiting funding (\$220,000) to complete this small project. Major practices include land leveling, water control structures, lateral improvements, and irrigation sprinkler systems. These contracts are similar to the LTA's under ACP, however, the funds are provided by SCS and the landowner contracts are with SCS for long-term implementation.



## Title II Field Review Followup, Uinta & Grand Valley Salinity Control Programs

As a followup to an October 1980 field review, the USDA agencies and the USBR have made substantial progress in resolving many issues identified during the review. Some of the issues and actions taken to resolve implementation problems are as follows:

1. Adequate staffing for technical assistance.

The Uinta Basin staffing has been maintained at 15 professional technicians and the Grand Valley SCS staff was increased from 9 to 13.

2. Required automation for onfarm irrigation improvement.

A more liberal language and interpretations for automation requirements have been provided. Essentially, automatic equipment becomes an eligible cost-share component where planned and recommended by the farmer and SCS as part of the total irrigation water management system.

3. Lack of onfarm water management followup.

An irrigation water management technician position has been established in Grand Valley for this specific purpose. The Utah SCS staff has developed specific plans for more onfarm followup in 1982.

4. Uniform lateral standards and sizing.

SCS and USBR have collaborated to develop more compatible lateral sizing and similar design standards.

5. Monitoring effects of onfarm program.

SCS, in conjunction with ARS and Colorado State University has continued to monitor onfarm irrigation activities in 1981 in Grand Valley. A more comprehensive long-range monitoring and evaluation plan is being developed for Grand Valley and the Uinta Basin.

Other concerns and issues listed below still represent major items needing further resolution if the Colorado River Basin Salinity Control Program is to be truly successful. Additional efforts will be taken to address these issues in 1982.

1. Need for long-range funding commitments for:

- a) cost-share funding for irrigation water management practices
- b) technical staffing for full scale implementation

2. Overcoming cost-share limitations imposed by present ACP requirements:
  - a) \$3,500 per year limitation per farmer in annual or LTA's
  - b) \$10,000 per year limitation in pooling agreements
  - c) Cost-share amounts being taxable
  - d) Qualifying Indian lands for cost sharing
  - e) Inability to cost share with irrigation districts or companies.
3. Reliability and maintenance of automated equipment:
  - a) Ability to withstand elements, livestock, and farm equipment
  - b) Availability of replacement parts and repair service
  - c) Simple repairs and adjustments by farmers.
4. Conservation planning and technical assistance:
  - a) Balance or imbalance of LTA's vs. annual practices
  - b) Rate of total onfarm irrigation water management system planning
  - c) Continued education and followup water management assistance.
5. Environmental consequences:
  - a) Fish and wildlife measures last to be implemented
  - b) Impacts on wildlife habitat and mitigation efforts
  - c) Effects of mitigation on salt and water budgets
6. Monitoring and evaluation:
  - a) Development of a comprehensive long-range monitoring and evaluation program.

While progress has been made, there remain many issues and concerns which need further attention. USDA and interagency efforts will be directed toward these problem areas in 1982.

# IRRIGATION SALT SOURCE UNIT STUDIES

In accordance with Title II of the Colorado River Salinity Control Act (Public Law 93-320), USDA carries out detailed salinity surveys and investigations in cooperation with USBR and the EPA. Essentially, the SCS conducts special irrigation salt source area unit studies to: (1) determine extent of salt source loads to the Colorado River from private irrigated, range and forested lands; and (2) determine extent of onfarm irrigation and land treatment improvements needed to increase irrigation efficiencies, reduce deep percolation losses, and reduce runoff and erosion in lowering total salt loading to the Colorado River. The SCS conducts these studies under authority of Section 6 of Public Law 93-566 using special river basin study funding.

A brief status report of these unit studies are presented in Table IV-1. Studies completed in FY 1981 are: Moapa Valley (NV); Big Sandy (UT); and Lower Gunnison (CO). The McElmo Creek (CO) and the Virgin Valley Sub-evaluation Unit (NV & AZ) are scheduled for completion in 1982. Inactive or suspended studies are presently "not scheduled" because of various reasons. The Palo Verde study is pending the USBR lateral study. The Little Colorado River has limited potential because of scattered and minimal irrigation benefits. The other studies either lack significant irrigation benefits or local support and initiative for further study.

Table IV-1

## Status Report Irrigation Salt Source Unit Studies Colorado River Basin Salinity Control Program

Unit Study Area	Implement Started	Date Published	Planning Status		
			EIS	Review Draft	Preliminary Investigation
1) Grand Valley (CO)	1979	Dec. 77	Compl.	-	-
2) Uinta (UT)	1980	Jan. 79	Draft	-	-
3) Big Sandy River (WY)	-	Nov. 80	-	-	-
4) Moapa Valley Subeval.(NV)	-	Feb. 81	-	-	-
5) Lower Gunnison (CO)	-	Sept. 81	Draft	-	-
6) McElmo (CO)	-	-	-	Draft	-
7) Virgin Valley Subeval. (NV & AZ)				Draft	-
8) Price-San Rafael (UT)					Underway
9) Upper Virgin (UT)					Underway
10) San Juan - Mancos Valley (CO)					Just Starting
11) Colorado River Indian Reserv. (AZ)					Underway
12) Palo Verde (CA)		Inactive			
13) Lower Colorado R. (AZ)		Inactive			
14) Dirty Devel (UT)		Inactive			
15) Roaring Fork (CO)		Inactive			
16) Henry's Fork (WY)		Inactive			
17) Lyman (WY)		Inactive			

## RESEARCH, DEVELOPMENT AND DEMONSTRATION

Recent ARS activity with reference to the Upper Colorado has come about by redirection of inhouse funds. Level basins are being studied as a surface irrigation method that eliminates surface runoff or tailwater, allows close control of deep percolation, and has a low labor requirement. Level basins are less suited to the Grand Valley, with its steeper slopes and shallower soils, than to the Wellton-Mohawk project. However, a survey has shown that about one-third of the Grand Valley may be suitable for level basin systems. Additional research is under way for effective irrigation scheduling and the effect of high, saline water tables on irrigation water requirements.

Another research and development component concerns the evaluation of available automation equipment, development and testing of new devices, and working with farmers to integrate these components into an effective management system. A number of the shortcomings identified in the action program are being addressed by the research program. Furthermore, work has been funded by ARS at Utah State to develop a system of "surge irrigation" that may help solve the variable infiltration rate problem in Grand Valley; and at Colorado State University to assess the strengths and weaknesses of the ongoing onfarm improvement program in the Grand Valley and to monitor benefits on this program.

Additional research activities include developing means of overcoming the variable infiltration rates already mentioned, improving designs and canal turnout and pipelines to solve problems associated with sediment deposits in pipelines, and developing methods for assessing the benefits of the onfarm and lateral improvement programs.

## INSTITUTIONAL AND INTERAGENCY ACTIVITIES

Continued interagency activities and coordination efforts are being maintained in accordance with executed MOU and MOA. The Forum Work Group, the Federal Interagency Salinity Control Committee and the USDA Salinity Control Coordinating Committee are the primary groups handling interagency communications and liaison with the Colorado River Basin Salinity Control Advisory Council and Forum.

Within USDA, and specifically within SCS, national program leadership has been shifted from the Basin and Area Planning staff to the Water Quality Project Implementation (WQPI) staff. Walter F. Rittall, Director, WQPI, has also been designated the USDA Salinity Control Liaison Officer.

The USDA agencies are also revising the MOU between SCS, ASCS, ARS, CSRS, and ES for the Grand Valley and Uinta Basin projects. Essentially, two separate documents have been combined into one revised MOU for both projects. Formal execution of the revised MOU should occur in 1982.



## FUNDING AND BUDGETING

The present matrix of multiple USDA agency funding and use of multiple USDA program authorities for implementing the Colorado River Basin Salinity Control Program continues to be difficult to coordinate. The funding levels have been inadequate to maintain the planned 10-year implementation schedule for Grand Valley and the Uinta Basin. It will also be necessary to improve and increase funding levels to achieve overall target salt load reduction goals by the year 2000.

Fiscal year 1982 USDA funding levels are continuing at approximately the same rate as in 1981. The general breakdown is as follows:

SCS - Technical Assistance	\$500,000
Salinity Unit Studies	200,000
ASCS - Cost-share Support	3,700,000 <u>1/</u>
ARS - Research Demonstration	416,000
CSRS - Research Support	161,000
ES - Extension Education	<u>250,000</u>
Total	\$5,227,000

1/ Includes 5% transfer to SCS for technical assistance.

Under a proposed USDA FY 1983 budget package, a USDA consolidated account for the Colorado River Basin Salinity Control Program was recommended. However, it was not included in the FY 1983 budget. A similar consolidated account will likely be proposed in future years.

## PROJECTED 1982 ACTIVITIES

Projected 1982 USDA activities include the continued implementation of the Grand Valley and Uinta Basin projects, as well as continuation of the irrigation salt source unit studies. Unit studies scheduled for completion include McElmo Creek (CO), Virgin Valley Subevaluation Unit (NV & AZ), and the Price-San Rafael Rivers (UT).

SCS will also be developing a comprehensive monitoring and evaluation program for the Grand Valley and Uinta Basin projects. This will include methodologies, procedures, and multiple staffing and funding levels for three different intensities of monitoring efforts.

Continued emphasis will be placed on establishing a consolidated USDA account for all Colorado River Basin Salinity Control funding. Also, USDA will be prepared to evaluate and respond to any legislative proposals relative to the Colorado River Salinity Control Program.





